
# MIDWEST APPLE IMPROVEMENT ASSOCIATION

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# President's Message

**Mitch Lynd**

## GETTING ORGANIZED

In the beginning (1997 in this case), it looked as if the PRI (Purdue, Rutgers and Illinois) apple breeding program for apple disease resistance was falling out of favor with University administrators. Funding was being reduced and many of us believed it could all come to an end. At the same time, overseas breeding programs were tightening up access to their new discoveries and marketing clubs began to appear in the U.S. One of the keys to the expected success of a marketing club is supply management, acquiring exclusive new cultivar production rights and strictly limiting their availability as part of their total cultivar management plan. Consumers were becoming tired of the tough skins, soft flesh and boring flavor of older main line apple cultivars like 'Red Delicious' and 'Macintosh'.

While new apple cultivar availability was shrinking, consumer demand for reduced pesticide use and more locally grown produce with its diminished carbon footprint was increasing. Minnesota and New York have world class apple breeding programs but their needs are different than ours in the Midwest. The late bloomers we need for escaping spring frost are of little interest in New York and because of Minnesota's short season, they need earlier ripening dates than are desirable in the Midwest. Apples well adapted to our lower Midwest region are unlikely to come from either the Minnesota or New York breeding program, although 'Honeycrisp' is currently receiving rave reviews by Midwestern growers and consumers alike. Additionally, Minnesota's 'Sweet 16' is proving to be one of our better breeding parents. Both of these apples hold up better in spring freezes than most other apples and better than any we've tested from New York.

Some of us realized we needed new and better apples but the details of how to go about it weren't clear. We questioned the wisdom of embarking on the painstakingly slow process of conventional breeding having recently witnessed brilliant transgenic breakthroughs that appeared to make conventional breeding practices obsolete. Flesh browning and fireblight resistance have both been conquered by genetic engineering but not yet released because of concern about public acceptance of GMO apples. Dr. Susan Brown, a Cornell apple breeder, assured us that advances from traditional breeding programs would prevail over genetic engineering for many years to come. She said finding and precisely repositioning *multiple* genes was necessary to regulate most of the traits we valued and that this was beyond the current ability of genetic engineers. We thought we should continue a conventional breeding program for disease resistant apples that were better adapted to the warmer but erratic continental climate of the Midwest even though we weren't sure what to do next.

Actually, we are still building the bridge to apple greatness while we are crossing it! The need for new crosses was obvious and we immediately made them. While we were waiting for fruiting, we began to think about evaluating the seedlings and marketing the better selections. Members had different ideas about how to do everything including the release and distribution of new selections. More on this topic will follow later.

The idea of cooperative effort in making crosses and evaluating new apple cultivars seemed better than each of us doing it alone and was unanimously supported. Because there are so many thousands of dud seedlings per each one of commercial merit, perhaps 10,000 to one, each member has little chance of obtaining a winner by putting out a few thousand seedlings on his own but if he agrees to share his results with dozens of others making a similar effort, the group effort is **nearly certain of producing winners for all.**

The idea of pooling our money and sharing the profits seemed like the American way to bring a simple solution to a simple problem *until we sought professional advice.*

## PROFESSIONAL ADVICE

First came the horticulturalists, mostly from universities, who said based on their experience with apple breeding programs, there would be **no profits** to share! They said the development costs of breeding new apples had traditionally exceeded benefits leaving nothing. They said this was one reason why most land grant universities were abandoning such programs but that farmers being both frugal and resourceful might be able to design a no frills breeding program that could possibly be successful. Among our early encouragers associated with land grant Universities were Dr. Jules Janick (Purdue), Dr. Susan Brown (Cornell), Dr. Herb Aldwinkle (Cornell), Dr. Joe Goffreda (Rutgers), Dr. Diane Miller (Ohio State), Dr. David Feree (Ohio State, retired), Ms. Anna Vordecker (Rutgers), Ms. Anna Whipkey (Purdue), Mr. Ken Livermore (Cornell, retired), and Mr. David Bedford (Minnesota). No one thought it would be easy but all thought it was possible to make new crosses, select improved cultivars and bring them to market.

Perhaps the earliest inspirational influence came from two folks working outside the land grant university system, Mr. Phil Forsline, curator of the U.S. apple germplasm collection at Geneva, N.Y. and Mr. Doug Shefelbine, a Wisconsin apple grower. Doug said he had over 40,000 apple seedlings in the ground. Some he felt were superior to any named apple on the market and that it was simply a matter of planting enough seedlings to improve the chances of discovering a better one and that any apple grower could easily do it. He felt that marketing a new apple would be more difficult than creating one and that for this reason he was going to seek an alliance with an established marketing professional who shared his concept of adequately compensating everyone in the supply chain from the breeder to the consumer and managing the cultivar for the benefit of all concerned, basically the "club" or "cultivar management" concept.

Like Doug Shefelbine, Dr. Steve Doud and Mr. David Doud (brothers), and Ed Fackler, all Indiana apple growers had all made apple crosses and were fully familiar with the techniques, problems and opportunities in apple breeding but they all said finding a better apple was a real long shot and successfully marketing it on a large scale would be even more difficult but achievable.

Then came the lawyers who said since we had members in several states (OH, IN, IL, WI, MO, KY, PA, MN) the cost of founding a "**for profit**" organization with investors located in many states required complex and expensive legal filings in each state, probably in excess of $75,000, plus the cost of certified annual record keeping, tax and legal filings. To us this seemed excessive considering we were about to launch an as yet unproven approach to apple breeding.

## ORGANIZATIONAL STRUCTURE

Finding ourselves short on funds, long on spirit but with a collective broad based distaste for detailed record keeping and paper work we were thrilled with the discovery of an organizational format called the "**non profit association**." Under Ohio law as long as we have no paid employees, income under $25,000/year and no profits, we are required to file no filings, forms or reports with anybody about anything; much like a local garden club or community service organization operates. To me, this was a "dream" organization and it has been our organization of choice up until now while we have been testing the apple breeding waters to see if we can actually do the things necessary to come up with a better apple. Now, after making several serious mistakes while stumbling into some startling successes, it appears as if it's time to consider organizational refinement. I am satisfied that we can actually do the things necessary to breed new and better apples without the cost of running a "big time" academic program burdened with huge administrative overhead and detailed record keeping associated with the academic questions of "why" and "how" things are the way they are. We too are curious about many of the unknown quirks of inheritance and are glad to openly share plant materials and data relevant to our test seedlings with any interested parties, provided they sign non-propagation agreements to protect patentability of our seedlings, but we really don't want to spend scarce funds or time on purely academic investigation.

Later, when and if we are able to derive sufficient cash flow from possible royalty payments from patented seedlings or are the recipients of research grants, this kind of work would be consistent with our objectives although lower ranking in priority than simply obtaining a better apple.

## TO PATENT OR NOT TO PATENT

In the early years of our organization many of us were indifferent with regard to whether we should patent new apples or simply release them to the public. Most of us were shifting to direct marketing having become discouraged with impoverished returns from wholesale apple marketing. As direct marketers our profitability comes mostly from our unique locations, typically a nearby local metropolitan customer base, and enforcement of our personal quality control standards. Whether other people grew the same apples or not, how many or what the quality control of others was; seemed pretty much irrelevant to an independent direct marketer's success or failure.

On the other hand to those of us who operate in the more price competitive wholesale apple market it has become clear that apple patenting coupled with total cultivar marketing management including branding, quality and supply control are prerequisite to sustainable profit margins for everyone in the supply chain including researchers, nurseries, growers, packers, wholesalers and retailers. In the words of an article appearing in the Harvard Business Review, "*for a business to succeed it must have an unfair advantage*." The "unfair" advantage they were referring to is the protection from competition provided by the patent laws. During the patent period of 20 years, the period of "unfair advantage," patent holders develop a financial return and a sustainable brand image for new products. The brand may then be protected by the trademark laws so long as the holder wishes to renew the trademark with the federal government.

Apple cultivars have been patented for years but the historic problem has been that the patent holders have been nurseries or packers whose financial incentives drive them to maximize sales with the consequence of apple supply excesses that serve marketers well but leaves unsustainable returns for growers.

## CLUBS WILL HELP BUT NOT PUT GROWERS ON EASY STREET

The administrative costs associated with total cultivar management, including market development and brand management

that provides reasonable returns to all parties in the supply chain are substantial and it is certain that new apples will be developed using the same promotional strategy by other regional or worldwide groups of competitors. The whole exercise is not without risk. In the future it is predicted that folks will say "*it sure seemed like a good idea at the time*." However, for the apple growers right now it does seem like a big improvement over recent so called "marketing" programs that controlled nothing. It should be emphasized that unless it is supported by an ongoing supply of new discovery and improvement, "clubs" too will fall victim of competition in an open and free market place where the cream of new discovery and better team management will rise to the top. In the mean time it seems like a good idea to level up the playing field a little and tilt the balance of economic power a little more towards the relatively disorganized apple growers and a little more away from the more highly organized marketing groups who all feed in luxury at the growers table, too often leaving them with unsustainable financial scraps.

## THE CASE FOR CREATING A 501C-3 CHARITABLE FOUNDATION

It is in the public interest to continually search for apple improvement. Leaving an ever smaller carbon footprint on the environment through reduced pesticide use and creating cultivars locally adapted to various continental climate regimes near a wide range of U.S. metropolitan centers will reduce energy costs related to food. Clearly this is in the public's best interest. It is in the public interest to improve the flavor and texture of apples in the drive to increase the per capita consumption of fresh fruits and vegetables, resulting in greater anti-oxidant consumption while reducing the incidence of obesity. New apples should be patented with the idea of using the royalty fees to continue funding an apple breeding program, not in anticipation of **distributable profits**. Profit centers lie with growers and marketers. The discovery foundation should be a public, nonprofit **source of funding** apple improvement, a legitimate and desirable social benefit. Breeding new apples, patenting and licensing new apple cultivar management will:

(1) Reduce pesticide use and its impact on the environment with increased use of disease resistant apples

(2) Improve the nutritional and obesity condition of consumers with better tasting & better keeping apples

(3) Help the competitive position of U.S. apple growers in a tough global economy

(4) Reduce the U.S. generated carbon footprint with locally adapted apples that can be grown near many more cities than is currently possible.

(5) Improve the U.S. balance of payments from reduced apple imports

Private and public grant money is available to fund worthwhile projects but in many cases it is limited only to organizations with a 501C-3 Internal Revenue Service Tax designation.

In addition, private donors often require the same designation of their gift recipients. Ultimately the foundation's success will depend on its ability to develop broad based support from other foundations, private donors and government agencies. Collaborative work with the Dawes Arboretum at Newark, Ohio, The Ohio State University, grower and consumer groups should enhance the long term success of the foundation. We envision it operating much like the American Chestnut Foundation. **Accordingly your Board of Directors has voted to incorporate the MIDWEST APPLE FOUNDATION under the laws of Ohio and apply for an I.R.S. 501C-3 charitable tax designation.** Conversely some grants and gifts are limited strictly to *grower* groups, hence the need to continue with the already functional grower "association."

## WHAT ABOUT THE HOPE OF APPLE GMOs?

What happened to the genetically modified blight resistant M9 rootstock from Cornell? Why don't we have BT modified apple trees to defeat codling moths and other lepidopteran species? I have not been able to get a straight answer from researchers but after reading *Seeds of Deception*, by Jeffrey Smith, there appears to be two good reasons. The first is a marketing concern, fear of a consumer backlash against GMOs, like the Alar incident, and secondly the insertion of genes into a double helix strand of DNA is not a matter of precise placement but more of a blind shot in the dark with regard to where the inserted gene lands. This is important because the gene's location in relation to other genes near it has everything to do with exactly what kinds of proteins or process the gene initiates. The effect of the gene is dependent on its location. It takes more time than previously expected to determine exactly what all the effects of a new gene might have on the target organism. Taking more time to study anything is in conflict with return on investment goals and companies like Monsanto are moving GMOs to market faster than many consider wise.

### THE BIG GENETIC SURPRISE

When scientists first started to map the human genome they were expecting to find about 120,000 genes. This was based on the number of different proteins and processes that were known to be genetically controlled in human beings. When they were finished mapping the entire genome they found only about 22,000 genes. It turns out that many, if not most genes, can cause completely different things to happen depending on the location of the gene and what other genes are nearby. Each gene can cause as many as 5 different things to happen or be made, depending on its location. In some cases its presence can affect the immune system in an opposite way than expected depending on its location relative to other genes. It takes far more time to evaluate all of the results of a gene transfer than originally thought. Hence, few releases have been made by responsible researchers, meanwhile Monsanto has moved ahead in what many believe to be a risky and reckless manner, driven by the need to produce quick returns on substantial investments.

## HOW ABOUT THAT APRIL FREEZE? IS HEAT TOLERANCE MORE IMPORTANT TO US THAN COLD RESISTANCE?

Back in 1992 the first planned Kazak expedition by the USDA to collect apple seeds in search of multiple sources of disease resistance and other unknown but desirable traits lurking in the genome of diversity, was almost called off because a late spring freeze in the apple forests of Kazakstan substantially reduced their apple crop. I quickly rallied to the support of continuing the expedition because the selection pressure of a late spring

freeze meant the seeds collected there would likely contain late bloomers and other, as yet not understood, genetic mechanisms useful in escaping damage from spring freezes near or during the period of bloom. The seeds were collected and later, at Cornell, the collected seeds were germinated and screened for resistance to fire blight, scab and powdery mildew. A subset of these seedlings was forwarded to Arkansas for lining out and evaluation but before they could be planted they fell victim to administrative budget cutting and were headed for the university dumpster when I intervened and pleaded for their custody. It now appears as though the dumpster was a pretty good idea!

After 10 years in the ground at the Dawes Arboretum at Newark, Ohio the following has become clear to me:

1. The Kazak trees, on average, bloom a week earlier than most commercial apples. Apparently, commercially successful apples have been selected over the last 6,000 years by human beings for later than average bloom dates.
2. The Kazak trees mature their fruit, on average, in late July. Apparently, commercially successful apples have been selected over the last 6,000 years by humans for later than average maturity dates.
3. The Kazak trees have average fruit size of less than 2 inches, nice crab apples. Apparently, commercially successful apples have been selected by humans over the last 6,000 years for larger than average fruit size.
4. Our Kazak trees do **successfully avoid spring freeze damage, but how they do it renders them practically useless to commercial growers.**
5. The Kazak trees don't squander many of their valuable photosynthates on fruit production, halting fruit growth by mid July, dropping their fruit to the ground and saving their precious juices for the next 3 months thus lowering the freezing point of their reproductive tissues during the following winter and spring.

At the time the Kazak seedlings were planted at Dawes I planted two antique apple trees with them, 'Ralls Jeanette' and 'Court Pendu Plat', known to bloom very very late. I did this to have a known standard of comparison to better judge the anticipated lateness of the Kazak seedlings. I was surprised and disappointed to find almost all the Kazak seedlings blooming earlier than almost every apple in our orchard, not to mention the very late bloomers. I was puzzled as to how they escaped spring frosts.

When the Kazak material bloomed early and had a surprisingly high survival rate I walked to the nearby antique orchard at Dawes Arboretum where there were 3 cultivars with many (25%) live flower buds, enough for a full crop. The other 15 or so antiques were 100% killed like all our commercial varieties. **The three survivors were 'Yellow Transparent', 'Duchess of Oldenburg' and 'Summer Pearmain'.** I realized they all shed their fruit in July or early Aug. like the Kazak survivors. In that moment it became clear that the key to their survival was simply that they minimize **photosynthate removal** from the tree. The bad news is, this very fact **always insures short season poor quality apples***, a result we are working hard to avoid!* Far better we focus on the search for high quality, longer season **late bloomers. The heat resistance of late bloomers is far more important to the Midwest apple growers than the cold resistance of early maturing short season cultivars.** There are two ways for an apple tree to beat a spring freeze in a continental climate but only the late bloomers with later maturity dates can deliver both reliable cropping and the high fruit quality needed in a competitive global market. For growers under the influence of maritime climates, bloom dates are pretty much irrelevant because nearby large bodies of water hold back the bloom dates and hold up the temperatures on the coldest mornings. I guess that's why they call the Midwest the "corn belt" instead of the "apple belt!" However, there is good news.

There are huge differences in the bloom dates of apples, far greater than generally realized by commercial growers. Among apple trees planted over a wide range of latitude in the Midwest these bloom dates become compressed as one moves from South to North with very little difference in bloom dates being noted in Minnesota, perhaps as little as 4 days, while the same collection of cultivars planted in Northern Alabama will often have a variation of 4 weeks. At the time I am writing this, May 1, 2007, here, Red Delicious is in petal fall but **'Edward the VII', 'Pomme Gris', 'Ralls Jeanette', and 'Court Pendu Plat'** are in *early* tight cluster. One of the Gold Rush × Sweet 16 seedlings here has only a few king blooms open this a.m. and the same is true of one at Sunny Hill Fruit Farm 30 miles South of here. Both these disease resistant seedlings had been selected last fall for outstanding fruit quality with soluble solids. The Sunny Hill selection averages 18%. The Sunny Hill seedling, SH10-1 had most of its flowers killed by the April 7 freeze but there were enough survivors for a modest crop, something that could not be said of any commercial cultivar at Sunny Hill. The seedling here, LY1-70 has only a few dead flowers and 95% survival but is not as high a quality apple as SH10-1. SH10-1 matures very late, first week of November LY1-70 matures in early October. Both are somewhat ugly insuring the direct marketing crowd that neither will ever show up on supermarket shelves. SH10-1 keeps like rocks while LY1-70 probably has decent keeping quality. We don't know. They tasted so good at harvest time they all were eaten by eager taste testers.

## FREEZE DAMAGE FACTORS

While the following info is all a collection of purely anecdotal grower observations over many years I believe it to have significant value. **The previous year's crop load** has a lot to do with not only whether the trees will bloom the next year but how hardy they are going into the next season. Many older growers, who have seen a lot of seasons come and go, can remember incidents where two blocks of apples, same cultivar, same age, same soil, but the only difference **was when they were picked**, sometimes left un-harvested, resulted in big differences in winter and spring hardiness and in some cases even return bloom. As an example, in previous spring freezes Honeycrisp has performed better than average for us, usually in the top 25% with regard to flower bud survival. However, this year, following a heavier than normal crop and picked at a little later stage of maturity than past years resulted in 100% flower bud kill on Honeycrisp. The same thing happened with regard to Golden Delicious. Golden Delicious always survives spring freezes better than most cultivars here but last fall we delayed the normal picking date so the later maturity would further en-

hance the eating quality for our U-pickers. For the first time ever we have no surviving Golden Delicious, while many cultivars generally regarded by us as less hardy than Goldens in late spring freezes have 20% live flowers. George Lamont, a well respected New York grower, recently told me of a similar experience he once had with 'Golden Delicious'. George said only a 10 day difference in harvest dates once made the difference the following spring of practically no flowers versus a normal full crop in the rest of the block.

## MIDWEST FREEZE IN THE MID 1990S

| | % live flowers | | % live flowers |
|---|---|---|---|
| Court Pendu Plat | 100 | Fortune | 10 |
| Ralls Jeanette | 100 | Senshu | 10 |
| Edward VII | 100 | Ida Red | 10 |
| Pomme Gris | 100 | Melrose | 5 |
| Sansa | 80 | Jonagold | 5 |
| Rome | 80 | Liberty | 5 |
| Honeycrisp | 80 | Braeburn | 5 |
| Sweet 16 | 80 | Jonathan | 5 |
| Stellar | 60 | Orrin | 5 |
| Russet Beauty | 60 | Empire | 0 |
| Gala | 40 | Enterprise | 0 |
| Cameo | 40 | Suntan | 0 |
| GoldRush | 30 | Belle De Boskoop | 0 |
| Coromandel Red | 30 | Mutsu | 0 |
| Spitzenburg | 20 | Pink Lady | 0 |
| Spigold | 20 | Red Delicious | 0 |
| Suncrisp | 20 | Williams Pride | 0 |
| Shizuka | 20 | | |

The above data was taken at Rocky Meadow Fruit Farm, New Salisbury, Indiana, across the Ohio River from Louisville, Kentucky. The same freeze caused similar results at Lynd Fruit Farm at Pataskala, Ohio with the following differences: 'Golden Delicious' and 'Macoun' (both not listed at Rocky), plus 'Melrose' and 'Suncrisp' all had a 40% survival rate at Lynd's, more than enough for a full crop. 'Lynd's Stayman Winesap' had 0% survival that year.

## NEWS FROM THE DAWES ARBORETUM

In a recent meeting at The Dawes Arboretum in Newark, Ohio with the Director, Luke Messinger, he told me the Johnny Appleseed Center for Apple Improvement is the centerpiece of the Dawes Arboretum's new master plan for future development. He showed me the site of the new welcome center overlooking a 50 acre field traditionally used for corn and soybeans but said it has now been assigned to the Midwest Apple Foundation for apple research, primarily our new seedling evaluation. He said our goals of developing new disease resistant apples better adapted to local climatic conditions meshed nicely with their mission statement and their new master plan for future expansion. The apple program will have educational, historical, and scientific components all centered around and combined with consumer's needs for nutritionally upgraded diets through better tasting apples and the communities' needs for pesticide reduction coupled with the energy savings of locally produced apples.

Soils in the new location are much better drained than the field we are currently planting in and it is hoped the need for fencing can be eliminated by the use of fabric softener sheets for deer repellent. If a fence is eventually required Dawes will help with the cost.

## RUSULTS OF SOME EARLY CROSSES

'PRISTINE' × 'GOLDRUSH', seedlings were lost to grass and weeds under the management of an inexperienced but well intentioned grower in Missouri.

'ENTERPRISE' × 'GOLDRUSH', seedlings were lost when the original grower, Jack Cruttenden, in Illinois sold the orchard. New owner mowed them down.

'SCARLET O'HARA' × 'GOLDRUSH', seedlings all went to Lynd Fruit Farm. All but two made gorgeous apples that tasted somewhat bland. Two have been selected for advanced testing. Several were 100% solid bright red color, big size but bland. The two that taste good are both yellow.

'GOLDRUSH' × 'PIXIE CRUNCH', seedlings all went to Lynd Fruit Farm Inc. All made apples too small to consider.

'GOLDRUSH' × 'CQR10T17', seedlings split between Sunny Hill Fruit Farm, Greg Bachman, Caroll, Ohio, and Eckerts' Orchards, Jim Eckert, Belleville Illinois. Maturity dates almost all in late October and flesh texture pretty tough and chewy. There are some good candidates for further testing, possibly 5, but with very late maturity.

'GOLDRUSH' × 'SWEET 16', almost all seedlings to Eckert's, a few to Lynd's. Many very good seedlings from this cross, 14 have been selected for advanced testing. Many more seedlings would have bloomed this year for the first time but were killed by the late freeze at Eckerts. This cross has yielded by far our most promising seedlings. If you would like to receive trees for testing purposes call Mitch at 740-964-4744.

OPEN POLLINATED 'GOLDRUSH', seedlings to Peace Valley Orchard, Rogers, Ohio, Danno Simmons, all have tasted pretty HO-HUM so far with nothing outstanding.

Many different crosses have gone in the ground at the Dawes Arboretum, Newark, Ohio but it is too wet to get good growth on most of the site and many of the seedlings planted their should have spent another year in the original seed nursery to be big enough for successful transplanting to the field. Planting in this field is being discontinued. Unfortunately this is the field we fenced with a very nice 8 foot fence. Looks like I fenced a swamp! Didn't seem that wet at the time. I and the folks at the Dawes Arboretum are all embarrassed. This will *never* happen again!

# MAIA 2007 Meeting

**Dawes Arboretum**
**Newark, Ohio**
**Saturday, November 3**

### DO APPLES TASTE BORING?

According to professional tasters, trained by and working for a fortune 500 food manufacturer, the mainstream apples we took them scored below 1.5 on a scale of 0 to 3 with regard to their overall impact and flavor complexity. Our best new selections scored mostly 2 and 2.5 with only one below 2. It is our belief that consumers find most apples rather plain and boring. We believe apple consumption will rise with the introduction of our newest, as yet un-named seedlings. These selections have the flavor intensity to better compete in the taste driven snack food market.

### NEW PRIORITIES

When there are no apples on the trees it doesn't much matter how disease resistant they are, how good they taste, how good they look, how long they keep or how high they yield. Accordingly it is my goal to have 40,000 seedlings in the ground at the Dawes Arboretum by 2014 in which one of the parents is known to be a very late bloomer. The other parent should be one of our advanced selections with disease resistance, great flavor and long keeping quality. With regard to great tasting disease resistant seedlings we now have many to choose from as breeding parents, most from the 'GoldRush' × 'Sweet 16' cross. Additionally there are about 7,000 seedlings in the ground of 'Honeycrisp' × 'GoldRush' crosses; many would have produced their first fruits this fall. The best of these should be good breeding parents and a source of texture improvement. Hopefully there are a few with texture close to 'Honeycrisp' but with higher soluble solids.

### THE FUTURE

If necessity is truly the mother of invention the Midwest will surely be the source of the next great apple *things*. P.J. O'Rourke said in writing for the Atlantic Monthly that great social changes always start at the bottom and work their way to the top. Ed Fackler always said the reason apple growers grew 'Red Delicious' for so many years was not that the apple was any good but that the growers were all "comfortably numb," relaxing in the profits of relative apple scarcity. What it all means is this: the apple genetics exist to produce great tasting, reliable cropping, disease resistant apples but the need to develop them is greatest here in the lower Midwest and I can see that this is where they will come from. The work is well underway. While I hope I can live long enough to see some of our better work cross the finish line into growers' orchards it is even more important to me that others not let recent freeze events discourage them from sharing our vision of increased apple consumption because apples can taste better than ever, require less pesticides than ever and can be grown locally throughout regions thought to be climatically hostile to apple growers. That all said, I've got to get away from this computer, get back in the orchard and make some crosses. The future won't wait!

# Club Varieties, Managed Varieties and You

**Wanda Heuser Gale**
**International Plant Management, Inc., Lawrence, MI**

It's all we seem to hear about; club varieties, managed varieties, proprietary varieties and intellectual property. What does it all mean? More importantly, what does it all mean to your bottom line?

We who live here in the real world, (not the west coast) tend to ignore things that mostly happen in Washington and California. It seems to be a long way away and their affairs don't usually impact our marketing all that much. Unless they dump apples on the market, we can pretend that our little world is going to stumble on as it has, blissful in our ignorance. But managed varieties are here to stay, and they are going to impact us more and more as time goes by and consumers buying habits change.

A managed or club variety is one that has any combination of things attached to it. It should be and usually is an exceptional variety. This variety should have enough good, distinctive characteristics to set it apart from the rest of the pack. I once heard the manager of a large packing house in Washington say that quality was not important and that any apple could be managed successfully if it were promoted enough. That's a dangerous idea. Our industry already suffers from a poor image because we market mediocre fruit. If we are going to invest a lot of time and money in a managed variety, it should be an exceptionally good variety.

A managed variety is intellectual property, or a proprietary variety. This means that it has patent and trademark protection and is owned by someone. A patent gives 20 year protection against unauthorized propagation of the plant. A trademark, which is not actually tied to a patent, gives renewable, but virtually unlimited ownership of the commercial name of the fruit. For example, Cripps Pink is US Plant patent #7008 and will be protected against unauthorized propagation till 2012. Pink Lady® is the trademarked name that is currently applied to the fruit of Cripps Pink.

A managed variety is just that, one where the entire aspect of the variety is managed from start to finish. There are as many variations of variety management as there are managed varieties, but in general they control who plants the trees, how many are planted, the packing and quality control of the fruit and most importantly, the marketing of the fruit to the consumer. Marketing is paid for in many ways, usually with a per box royalty that goes to the organization.

We live in a branded society. We shop by brand names, Coke, Levis, Kellogg's and Reebok. We equate the brand name with an expected level of quality and reliability. And we are willing to pay more for it. What Mother hasn't caved in and bought $55.00 Levis for a whining 13 year old when $15.00 unbranded jeans would have worked just as well?

Our history in the apple industry is to grow un-branded, commodity apples. We have specialized in the run-of-the-mill Reds, Goldens, Macs and Jonathans. We have expected our consumers to accept unexciting, ordinary apples and as a result, they moved on to more exciting fruit and snacks.

What the one department in a grocery store where consumers don't usually shop by brand names? Produce. And even there we have brands. Chiquita, Sun Gold, and California Grown. How could we expect the produce department to remain that last frontier for marketing? We can't.

This branded concept is now working its way into apple section of the produce department. Managed apple varieties are marketed directly to the consumer. The organizations are working hard to set their variety up as new, pretty, sexy or tasty. This is a great idea and I'm actually surprised that it took us so long to get around to it. The huge drawback in this system is that it is very, very expensive to market directly to the consumer and that is requires dedicated marketing professionals to do it.

Pink Lady is one of the oldest managed varieties and probably has the best name recognition. It fits the definition of a managed variety very well. It is a distinctive (pink) apple with very good flavor and shelf life. Their marketing program is great; apples with sex appeal. They have spun off with Pink Lady Nectar; you can even order Pink Lady T shirts. Pink Lady is virtually a world wide organization, which gives them the opportunity to market fresh apples year round. This year round marketing is becoming more and more important as it retains shelf space dedicated to that particular variety.

Europe is awash in managed varieties. European marketing systems are smaller or maybe just easier to handle and the managed variety thing has taken off. The good ones are doing very well. Quite a few of the not so good ones will probably disappear. One of the best, Kiku, is managing a red, striped strain of Fuji. They use very stringent quality controls, good management techniques, and an excellent communications chain with their packers and growers. Kiku has sponsored the Brazilian bobsled team for several years. It has nothing to do with apples but gets great exposure.

Europe also has, as far as I know, has the only managed, exclusively organic apple variety. Juliet is a scab resistant variety that is available only as organic. Juliet has an exceptionally attractive logo and is also doing very well.

So how will all this impact us, here in the real world? We do have a mid-western club being set up in Minnesota. MN 1914 will be grown practically all over but the base will be here in the mid-west. Minnesota farm marketers will have the opportunity to also grow MN 1914 without being in the organization. That is an idea with a lot of merit as farm marketers have the ability to promote directly to the consumer and can help a lot in name recognition. It also helps to defuse some of the problems with restricting a University of Minnesota variety. MN 1914 will not be available to direct marketers outside of Minnesota. I hope that the MN 1914 organization does very well. It will be nice to have a mid-west based club pumping money into the fruit economy. And it will lay a foundation for other mid-western clubs.

So, what are the advantages of a Managed Variety? First and foremost, it should provide the growers and the organization with a stable price for their fruit which should be well above the cost of production. Along with a nice profit margin, growers are also obligated to provide a very high quality product. Nothing wrong with either of those; growers need to make a profit and consumers will buy more apples if the quality is good.

Also, I believe that the more promotion of individual apple varieties that is done directly to the consumer, the better it is for the apple industry as a whole. Anything that gets consumers thinking about buying apples is a good thing. Just getting apples on a shopping list is an accomplishment. The apple industry is competing with the biggest advertising bucks out there. Consumers have to battle their way past chips, cookies, Twinkies and thousands of other snack items just to get to the apple section. Anything that gets consumers in the apple section is wonderful.

Alternately, what are the disadvantages to Managed Varieties? Obviously, if you are not in the club, you're out in the cold. Smaller growers and direct marketers especially are going to be left out. Most club varieties are going to be grown by larger growers that can handle the quantity and quality demands of the club. Already we are seeing a lot of dissention among growers who are "not in the club." This is a hard thing to deal with and as farmers; we are used to being in total control of what we can and cannot do. After all, farming is the last great frontier for independent types.

But hard as it is for us to face, we are living in a world where proprietary material is more and more important. None of us believes that it is ethical for a factory in China to make tons of fake Levis and dump them on the US market. We agree when people are prosecuted for stealing music off the internet. We are staunchly in favor of the free enterprise system and proprietary material is part of it. We just have to get used to the idea in our own world.

The marketing system for fruits and vegetables is changing. We are a global economy and we will have to learn to compete with not only the guy down the road but the grower in Chile. More and more we will become specialty growers. We will grow for our niche, whether it is direct market, wholesale, club varieties or organic. And many of us will not be in the club. Some of you may view these as "fighting words" but they're not. It's just another phase that we have to get through. We as American fruit growers have gone through many such phases in the past and we will get through this one too.

## MAIA
### Finance Report

**INCOME**

| | |
|---|---|
| Dues | $5,125.00 |
| Donation | $2,500.00 |
| Interest | $453.15 |
| Meeting | $90.00 |
| **Total Income** | **$8,078.15** |

**EXPENSES**

| | |
|---|---|
| Grow trees | -$2,494.80 |
| Treasurer | -$800.00 |
| Postage | -$82.68 |
| Newsletter | -$56.02 |
| Office supplies | -$24.08 |
| **Total Expenses** | **-$3,457.58** |

**Balance on 12/31/06 ..... $16,064.74**

# A "Wake-Up" Call for MAIA Breeding Priorities

**Ed Fackler**

Most of the "long-in-the-tooth" MAIA members will recall various discussions back in the mid-90s about the perceived need for breeding apples which could survive the **near-annual wild temperature swings** of a typical spring in most mid-west locations. Historically the single most prohibitive factor in the economics of Midwest US apple production has been (and continues to be) spring frost damage. This is exemplified by Mitch's long-ago remark, "*every other problem and associated cost is dwarfed by this factor*" and was strongly reaffirmed by the hard freeze that occurred in this past Easter weekend that followed an abnormally warm March.

However when 'Honeycrisp' became the industry's dominant new cultivar a few years later, this priority was sort of forgotten and the use of breeding parents expressly to delay bloom fell by the wayside. Sometime in early 2000 the idea that the collective positive attributes of 'Honeycrisp' (especially its great texture) and 'GoldRush', with excellent precocity, high or extreme flavor, and long storage would generate a much higher percentage of seedlings with good qualities and maturity dates would be over a very long period. The oldest 'Honeycrisp' × 'GoldRush' seedlings would have likely had their first crop this year had it not been for the recent hard freeze. (And there still may be a few flowers that survived this freeze.) The one adverse thing about using 'GoldRush' as a breeding parent became apparent last fall when a number of its progeny yielded their first crop. With the exception of 'GoldRush' × 'Sweet 16' progeny, all other crosses with 'GoldRush' parentage produced fruit with an extremely hard/chewy (and offensive to many folks) texture. This (undesirable) 'GoldRush' characteristic appears to be dominant in nearly all in all crosses except 'GoldRush' × 'Sweet 16'.

The wide spread freeze damage which affected the entire Midwest (and mid-south) US the past Easter weekend, while devastating to most growers, gives rise to ***new opportunities***. Amongst those original crosses chosen expressly to delay bloom (to avoid spring time frost damage) many seedlings do have some live flowers (on April 21 anyway). Live flowers exist within the 'Sweet 16' × 'GoldRush' seedlings at Jim Eckert's in Belleville, IL, 'Honeycrisp' × 'Fuji' seedlings at Dave Doud's in Wabash, Indiana, 'Sweet 16' × Coop 25 (Scarlet O'Hara') at Ray Armstrong's in Shepardsville, Kentucky and Sweet 16 × Melrose at Tipp City, Ohio (via those planted at Rocky Meadow, New Salisbury, Indiana). For that matter one Tipp City selection appears to be even later blooming than 'Sweet 16'. Although 'Honeycrisp' blooms later than most, if not all standard commercial varieties, the Easter freeze took out all of its bloom at most locations south of Indianapolis, Indiana and Columbus, Ohio. Conversely 'Sweet 16', growing in the same two orchards (Apple-Works in Trafalgar, Indiana and Lynd Fruit Farm, Pataskala, Ohio) still possesses live flowers as of this date.

Of course the common parent above (except the one using 'Honeycrisp') is 'Sweet 16' and it now seems logical to use it with another high quality late flowering variety like 'Ralls Genet' that blooms even later ('Ralls' is one parent of 'Fuji'). Not only does this cross give the potential for a wide array of seedling maturity dates with 'Sweet 16' maturing some 20 days prior to 'Red Delicious' (around 'Gala' time) and 'Ralls' maturing some three weeks later than 'Red Delicious' (or with 'GoldRush'), this combo also has the ability to ratchet up flavor (from 'Sweet 16', especially), texture (from 'Ralls') and of course very late bloom (both). Additionally 'Ralls' is extremely productive and is self-fertile.

The *"new opportunity"* mentioned above is most likely a yet-to-be positively identified tree sitting within the progeny of 'Sweet 16' × 'GoldRush' on Jim Eckert's farm. Those trees at Jim's were the most advanced when this freeze took place and therefore seem likely to possess the greatest possibilities for candidates to release and even more important, may produce the finest parent(s) to be used expressly to breed apples for frost and/or freeze resistance. I do know that these trees will be watched a tad more closely than in years past. Further, several selections (around 7 or 8) have already been identified by Chris Doll and others from Jim's seedling blocks for advanced testing. Trees of these selections are in the propagation process and will be available soon.

## The 2007 MAIA Annual Meeting: Maybe the Most Important Ever!

The Annual MAIA meeting is set for Saturday, November 3, 2007 at Dawes Arboretum in Newark, Ohio. See their website for directions and detail. (http://www.dawesarb.org)

The emphasis of this meeting will be selection and evaluation protocol for fruit of newly producing seedlings. Since there are many seedlings fruiting now in several locations, it would seem appropriate to define detail of the selection process and steps for propagation to dwarfing stocks to be distributed for further evaluation.

Hopefully we'll have at least one (perhaps more) professional apple breeders with much experience in the entire process of seedling selection/evaluation on hand to help address the desired criteria for choosing those apples expressly for direct marketers (versus the traditional wholesale trade).

Also, for those who'd like to come a day prior Mitch invites you to his farm to inspect his MAIA seedling rows. Meeting details will be mailed by late September and will be posted on MAIA website as they are firmed up. (http://www.hort.purdue.edu/newcrop/maia/default.html)

I hope to see you all there.

# Searching for Apples Even a Bug Can't Stomach: Insect Resistance in *Malus* Germplasm

**Clayton T. Myers**

While a number of genetic improvements to apple have come to fruition via the study of exotic apple germplasm, little is known about the potential for developing apples that are naturally resistant to fruit feeding insect pests. Given the increasing costs of adequate pest management in the 21st century, and given the increasing regulatory and market-based demands for more sustainable production practices, the development of pest-resistant apples would be of great value to an industry struggling with such numerous obstacles to profitability.

Since early 2005, a concerted USDA research effort has been initiated to observe and evaluate collections of domestic and exotic *Malus* germplasm for the presence of pest-resistance traits. In coordination with the USDA-Plant Genetic Resources Unit (PGRU) research group in Geneva, NY, I have been spending the past two years evaluating diverse germplasm housed at the New York Agricultural Experiment Station for resistance to major apple pests, including plum curculio, oblique-banded leafroller, apple maggot, oriental fruit moth, and codling moth.

The main emphasis of these observations and experiments has been with the PGRU 'core' *Malus* germplasm collection (Fig. 1). This 'core' collection includes a number of scab resistant apple hybrid selections previously released from the Purdue-Rutgers-Illinois (PRI) breeding program, several of which were released with claims of insect pest resistance. Additionally, this collection houses exotic germplasm representing nearly 90% of the known genetic diversity within *Malus.* Beyond work with this core *Malus* subset, preliminary observations have also been made with collections *Malus sieversii* seedlings from Kazakhstan that were brought to the United States in the early to mid-1990's, as well as seedling collections of a number of other *Malus* species collected from Europe and East Asia.

**Fig. 1.** 'Core' *Malus* germplasm collection, housed in Geneva, NY. This planting is composed of replicated placement of approximately 200 *Malus* accessions, representing approximately 90% of the known genetic diversity within *Malus*, and constitutes a representative subset of the larger *Malus* collections housed at PGRU.

## Approaches and Methodology

In 2005, research efforts focused on intensive field evaluations of the 'core' *Malus* germplasm collection for damage caused by native populations of apple pests. While the block was not sprayed with any insecticides in 2005, it was intensively managed prior to that time. Thus some of the leads established in 2005 (i.e., discovery of 'pest-free trees' in the field) were later found to be 'false positives' after subsequent evaluations were conducted under conditions of higher pest pressure.

Beyond such field evaluations, rigorous laboratory assays were conducted on fruit that appeared most promising based on field evaluations conducted in both 2005 and 2006. Laboratory evaluations were conducted to observe feeding and oviposition behavior of plum curculio on fruit presented under conditions of dual-choice (i.e., adults were given a choice between an experimental accession vs. fruit from a known susceptible cultivar) and no-choice (i.e., adults were placed on an experimental fruit and were given no alternative food source). Female oviposition damage and feeding damage by both males and females were assessed over time. Survival of larvae hatching from eggs laid in fruit was also assessed in the laboratory. Oblique-banded leafroller larvae were exposed to leaves and fruit and survival, developmental time, and feeding was assessed over time.

Similarly, apple maggot adults were assayed in both choice and no-choice arenas for oviposition on fruit from a number of *Malus* accessions, and larval survival in fruit was also assessed. Internal feeders, codling moth and oriental fruit moth, were evaluated for their oviposition preferences on both leaves and fruit of *Malus* accessions under a number of laboratory, greenhouse, and field conditions. Neonate larvae were assayed for their ability to enter fruit and survive successfully inside fruit. Survival was assessed under a number of laboratory conditions using fruit at a number of different maturity stages. Conclusions drawn were based on the best available statistical analyses of such behavior and survival outcomes.

## Preliminary Results and Conclusions

While some significant differences in feeding and/or oviposition preferences were observed, there was no true resistance exhibited among any germplasm to attack from plum curculio or oblique-banded leafroller, even among selections that were previously described as resistant. A number of accessions previously reported to be resistant to attack from apple maggot and plum curculio were also shown to be quite susceptible, underlying the importance of clarifying definitions of resistance, and utilizing rigorous screening procedures for determination of resistance to insect pests. This was also especially true for

codling moth and oriental fruit moth experiments as well, where a number of previously published 'resistance' annotations were demonstrated to be erroneous. Clarification of the horticultural literature and of USDA's online Germplasm Resources Information Network (GRIN) is necessary to prevent confusion among breeders and future researchers on the true resistance status of a number of accessions housed in USDA germplasm collections.

While almost all apple and crabapple accessions were shown to be quite susceptible to oviposition damage by apple maggot flies, there was significant variation in larval survival within fruit. One hybrid selection (E36-7) was demonstrated to be quite resistant to larval feeding by apple maggot until very late in the season. While this selection has fruit that matures late in the season (and hence could have resistance due to high fruit firmness during periods of highest apple maggot activity), a number of other late-maturing selections were shown to be quite susceptible to feeding damage from apple maggot larvae, indicating that factors beyond fruit maturity are likely contributing to this observed resistance.

Two crabapple species have been shown to be resistant to larval feeding by codling moth and oriental fruit moth. While *Malus* x *soulardii* appears to be resistant to codling moth in the early season, fruit from the Japanese pillar crab apple, *Malus tschonoskii* appears to be resistant to feeding attack from both oriental fruit moth and codling moth throughout the entire season. Further follow-up studies are needed to confirm this observed resistance and to gain a better understanding of the actual mechanisms responsible for this resistance.

While there is considerable excitement associated with the discovery of apples with apparent resistance to internal feeders, *M. tschonoskii* has a number of negative horticultural traits that will present challenges to breeders. Of primary concern is the tree's susceptibility to fire blight. One of the problems I've encountered with this species is that the number of fruit for evaluation is limited by low survival of trees in the field. In all the collections housed at Geneva, only two trees are currently surviving at an age where they can provide a significant number of fruit. Others have died and have needed periodic replacement due to fire blight mortality.

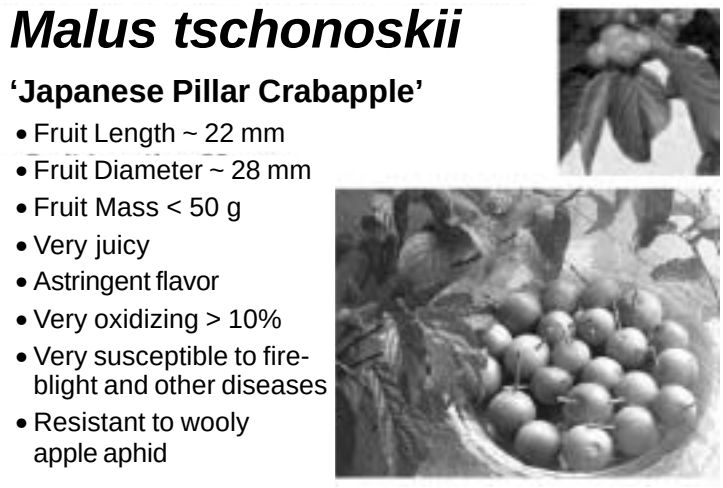


**Fig. 2.** Traits of the Japanese Pillar Crabapple, *Malus tschonoskii*, which has been shown to be highly resistant to feeding damage from oriental fruit moth and codling moth larvae.

Additionally, fruit of this species are quite oxidative and astringent. When first working with this species, I noticed that when I would cut apart fruit to search for surviving larvae, the fruit flesh seemed to turn brown almost instantaneously. This type of observation is likely correlated with very high concentrations of phenolic compounds and high levels of polyphenol oxidase activity. Because of the established roles of such compounds in plant defense mechanisms, this is a finding of great interest from an entomological standpoint. However, an unfortunate reality of chemical ecology is that compounds that taste bad to insects can often also taste bad to people. In the case of apples, a pest-resistant apple that is also unpalatable to a fickle market may not be of much value to the industry. This is why it is very important for researchers to isolate and identify the true source of the observed resistance and to determine if resistance is due to a single compound, a suite of compounds, or perhaps some other factor entirely different.

### Future Research Objectives

Based upon the conclusions from preliminary research and feedback from stakeholders, the emphasis of continued research will likely shift toward a focus on the internal fruit feeding pests, codling moth, and oriental fruit moth. While resistance has been observed in the crabapple species mentioned previously, the exact mechanisms of resistance are unknown. Studies are now being conducted to determine whether or not resistance to feeding is due to actual larval mortality or simple non-entry behavior. Assessments of larval entry time, entry depth, and other feeding behaviors are being conducted to better understand whether the source of resistance is located in the fruit flesh, fruit skin, or perhaps compounds within the waxy fruit surface. Elucidation of the true mechanisms underlying resistance is necessary before any major steps can be made toward development of new cultivars.

Finally, a key area of research interest involves fruit phytochemistry and its underlying genetic regulation. Research is ongoing to evaluate the expression of phenolics and other constitutive plant defenses among fruit from resistant accessions. If such phytochemical variation can be correlated with insect responses among a number of *Malus* accessions, such information can be used to elucidate and pinpoint the underlying genetics controlling the expression of pest resistance. Hopefully this will lead research efforts forward, and help to hasten development of marketable and appealing pest-resistant apple cultivars.

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